29. Healthy People 2020 - Improving the Health of Americans. Available at: http://www.healthypeople.gov/2020/default.aspx. Accessed January 17, 2013.
30. Bruckner M, Mangan M, Godin S, Pogach L. Project LEAP of New Jersey: lower extremity amputation prevention in persons with type 2 diabetes. Am J Manag Care 1999;5:609-16.
31. Goldberg J, Cronenwett J, Goodney PP. Effect of race and diabetes on amputation prevalence. J Vasc Surg 2012;56:1663-8.
32. Van Gils CC, Wheeler LA, Mellstrom M, Brinton EA, Mason S, Wheeler CG. Amputation prevention by vascular surgery and podiatry collaboration in high-risk diabetic and nondiabetic patients. The operation desert foot experience. Diabetes Care 1999;22: 678-83.
33. Mills JL Sr, Armstrong DG, Andros G. Rescuing Sisyphus: the team approach to amputation prevention. J Vasc Surg 2010;52:1-2S.
34. Simons JP, Goodney PP, Nolan BW, Cronenwett JL, Messina LM, Schanzer A. Failure to achieve clinical improvement despite graft patency in patients undergoing infrainguinal lower extremity bypass for critical limb ischemia. J Vasc Surg 2010;51:1419-24.

Submitted Oct 9, 2012; accepted Nov 16, 2012.

Additional material for this article may be found online at www.jvascsurg.org.

DISCUSSION

Dr John Ricotta (*Washington, DC*). Some of the critics of this type of analysis suggest that the regional approach blunts the impact of local socioeconomic factors and that when you look at areas within a region, the socioeconomics play a more important role than the number and type of services within the broad region. Isn't it possible that the intensity of vascular care really reflects the socioeconomic status of these various regions? I say this coming from Washington, DC, where we have a very high incidence of amputation, and I can assure you that we've got lots of vascular surgeons. Many believe that access to care is the problem. I'm not sure this is the case. My personal experience is that availability of services is not the major problem. Rather, people of low socioeconomic status do not access the care that is available until it's too late. We see a lot of patients for the first time where revascularization is not an option.

Dr Philip P. Goodney. I think this reflects exactly that point. And, much of the research, as it falls out of the Dartmouth Atlas, is: Is too much health care being provided? And, I think our project here shows that perhaps in this setting, health care is needed for these patients, and it was needed earlier. These are patients who have insurance, they have Medicare, and they should have probably gotten more vascular care than they did in the year prior to amputation.

So, Dr Ricotta, I think your point is well taken. There is a population of patients in whom vascular care is not aligned with need, and that's why I think our study shows not that we need more vascular surgeons, but that we need to properly direct amputation prevention initiatives toward those patients who need them the most. So, I agree entirely with your discussion.

Dr Ronald Dalman (*Stanford, Calif*). Phil, I really am very impressed with your continuing insight into these processes. I want to just provide a cautionary observation about the validity of some of these observations taken from 30,000" feet.

I noticed with interest that you mentioned that Santa Cruz, California, for example, does well with amputations versus intensity of vascular care, but there are, in fact, no board-certified vascular surgeons practicing in Santa Cruz, and there are a number of interventional radiologists and others who do a lot of procedures but not amputations. So, when the patients ultimately do need an amputation, they are referred to other regional "amputation centers," with which we have some experience.

So, I would just point out this problem, which is when you draw these conclusions taken from administrative databases, there are a lot of other details that might be lost in translation, as far as that goes.

Dr Goodney. That's a great question, Dr Dalman. I appreciate you bringing it up. All these analyses are based on a patient's zip code of residence, so it's where they live, not necessarily where they received their treatment. So, for exactly that point, one wants to make sure the regions aren't punished for providing high-risk care. So, if your hospital is the referral center for the most complex patients, this analysis wouldn't necessarily penalize you. But, that's certainly a good point.

In addition, our data is 30,000" data. However, the persistent trend is that no matter how we looked at it, we found the same effect and therefore we think it likely represents a real finding.

Dr John Hallett (*Charleston, SC*). Phil, I speak on behalf of the Carolinas Vascular Study Group, because you've really focused in our region.

I think there is an opportunity for the vascular study groups to improve these results. In South Carolina, we were once 50th in the country in terms of stroke because of hypertension. And, Dr Brent Egan at the Medical University has led a statewide program that improved hypertension therapy and reduced stroke over the last 25 years.

So, with this kind of information, we need to go back to our regions where this is a problem and think about how we increase access and education to decrease amputations.

Thank you very much for bringing this forward.

Dr Goodney. Well, thanks, Dr Hallett, and I appreciate it. As the VQI gains momentum, I think that's a perfect forum to address this issue. I was pleased to see how these results from our reflected changes that could potentially be made at a national practice. And, I agree that the VQI could potentially serve as an outstanding forum to push those changes ahead.

Dr Amy Reed (*Hershey, Pa*). I have two questions. Infection often plays a role. How many of these patients had amputations for infection, because clearly some of them don't need the revascularization procedures performed.

And also, with the advent of a lot of telemedicine, some of that more in the VA, does your working group have any ideas of how you might go forward or how we could take this out into some of the underserved areas to use perhaps telemedicine? Are there any other areas where telemedicine is being used and we might be able to piggyback on that?

Dr Goodney. At the inception of this project, I wondered that very question, and should the intensity of care ever be 100%, should all these patients get revascularization? The answer is, of course, no, as certainly there is going to be the patient with diabetes and palpable pulses who lost their foot because of advanced local disease.

I don't know exactly what that rate should be. I suspect it's somewhere in between 33% and 60%. The exact proportion of amputations that had only infectious codes as compared to any other of the PAD codes I would estimate at approximately 20%.

And, as for your second question, I think the VA will be where we want to turn some of our efforts in the future because in essence it obviates many of the access-to-care issues we've encountered here. There are vans that will bring you to the VA. There is podiatric care integrated into vascular care there. So in some sense, it might actually sort of simulate what we might aim towards in the future. And, telemedicine will certainly play a big part in that.

Dr Eugene Lee (*Sacramento, Calif*). Is there a biologic effect that may cause African-Americans to have higher amputation rates or is race a surrogate for lower socioeconomic levels which may be the actual cause for the higher amputation rates?

Dr Goodney. African-American patients in Chicago have similar amputation rates to their non-black counterparts, so at least from the 30,000" level, I'd say maybe not. I'm certainly not a basic scientist and that would be a presumption on my part to say that. But, at least our data do not suggest that there are inherent differences. They seem to be reflected in patterns of practice.

Dr Hernan Bazan (*New Orleans, La*). Very nice presentation. Were you able to look at age differences? The reason why I ask that is because if you look at a map of stroke in the U.S. (the "stroke belt"), it almost overlaps the map that you showed. There is a hypothesis that atherosclerotic disease is advanced in the Southeast United States because of diet (high saturated fats), smoking, and even cultural things that people do. So, I wonder if you noted any differences in age and presentation in the Southeast or the areas where there are higher amputations than in other areas?

Dr Goodney. We did see a strong effect by age, a more than 2.5-times effect in terms of the risk of undergoing amputation without an antecedent revascularization, and those effects were indeed stronger in the amputation belt.